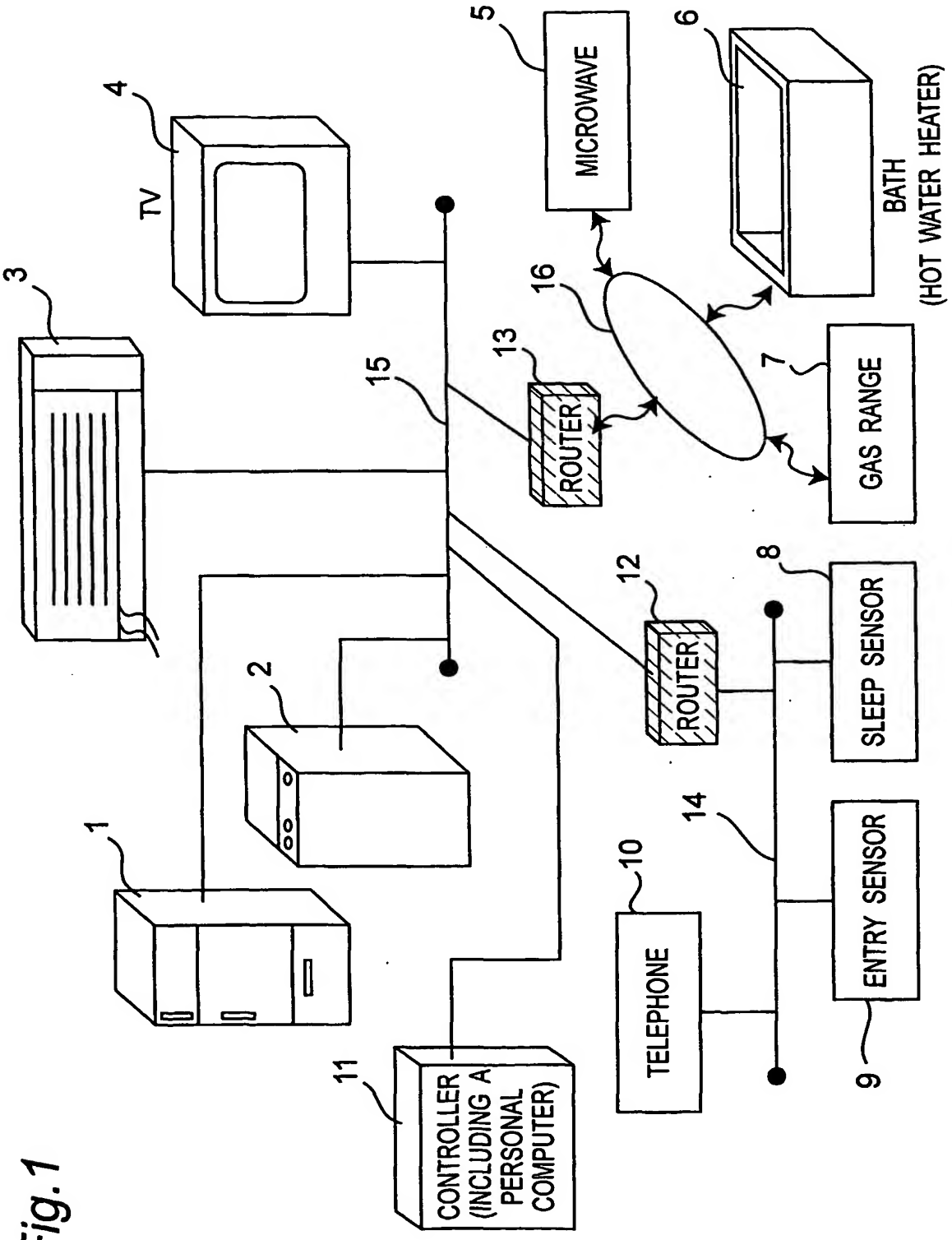

1
2
3
4
TV
5
MICROWAVE
6
BATH
(HOT WATER HEATER)
7
GAS RANGE
8
SLEEP SENSOR
9
ENTRY SENSOR
10
TELEPHONE
11
CONTROLLER
(INCLUDING A
PERSONAL
COMPUTER)
12
ROUTER
13
ROUTER
14
15
16

Fig.1

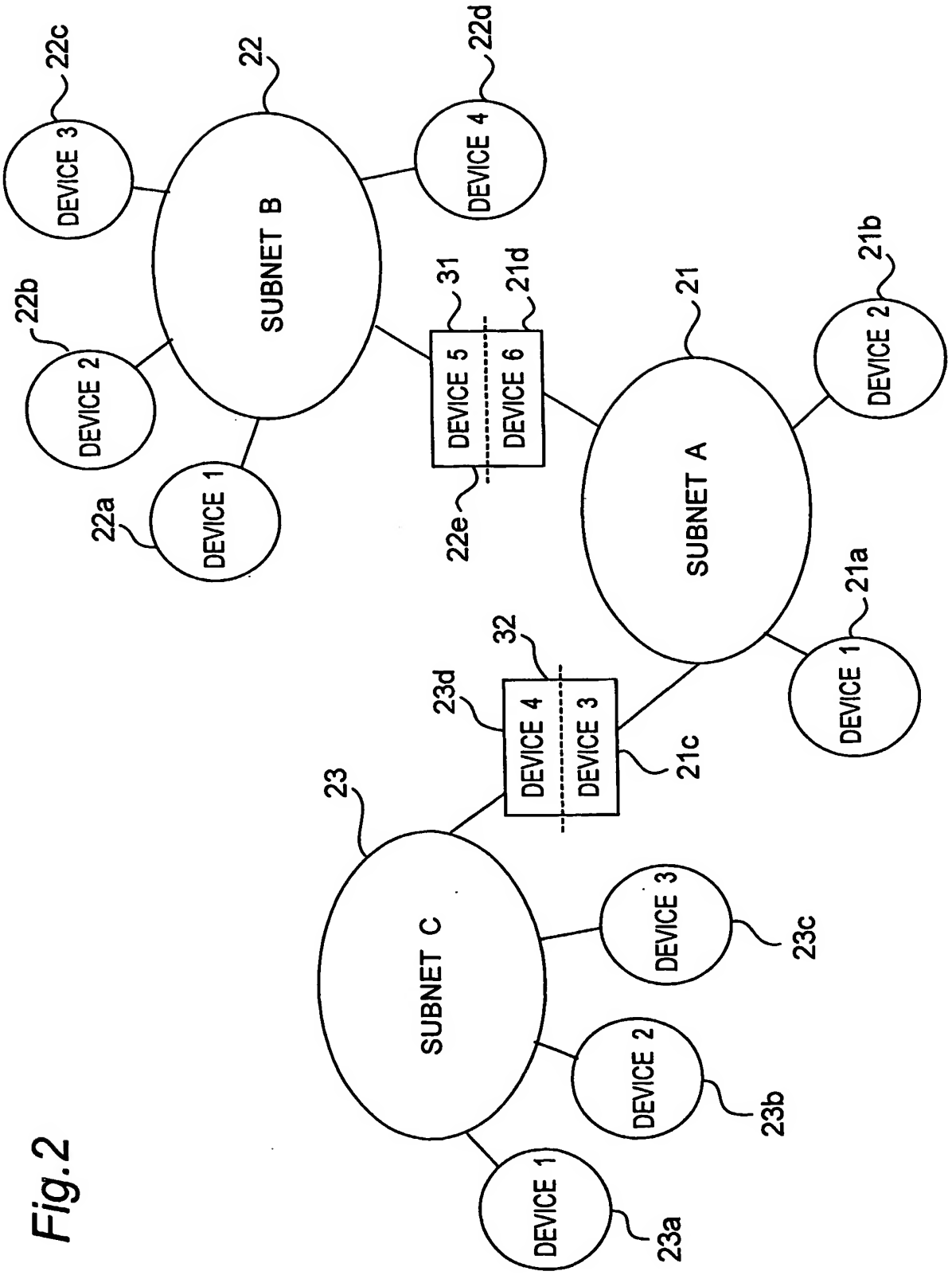
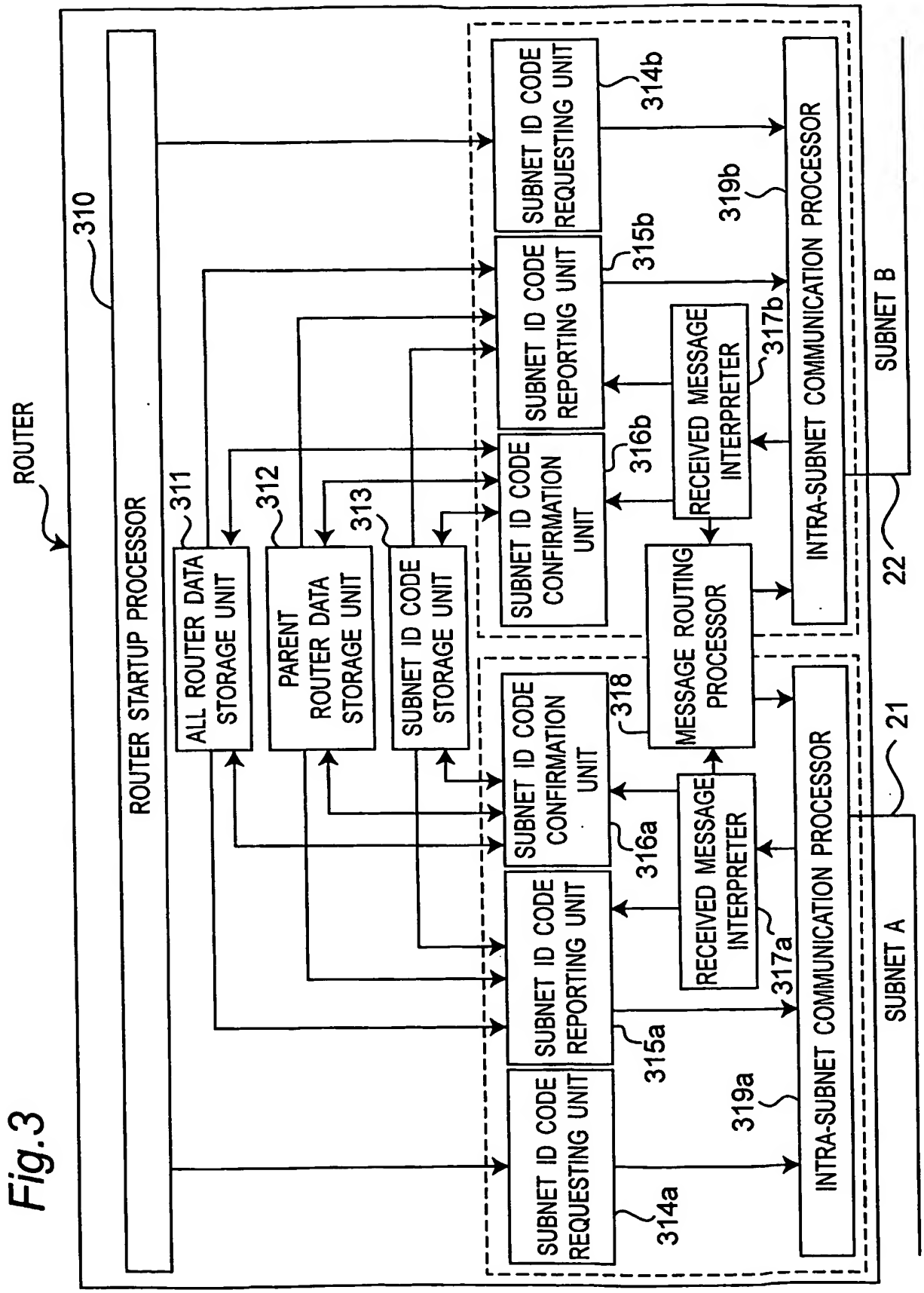

SUBNET A
SUBNET B
SUBNET C
DEVICE 1
DEVICE 2
DEVICE 3
DEVICE 4
DEVICE 5
DEVICE 6
21
21a
21b
21c
21d
22
22a
22b
22c
22d
22e
23
23a
23b
23c
23d
31
32

Fig.2

Fig.3


ROUTER
310
ROUTER STARTUP PROCESSOR
311
ALL ROUTER DATA STORAGE UNIT
312
PARENT ROUTER DATA STORAGE UNIT
313
SUBNET ID CODE STORAGE UNIT
314a
SUBNET ID CODE REQUESTING UNIT
315a
SUBNET ID CODE REPORTING UNIT
316a
SUBNET ID CODE CONFIRMATION UNIT
317a
RECEIVED MESSAGE INTERPRETER
318
MESSAGE ROUTING PROCESSOR
319a
INTRA-SUBNET COMMUNICATION PROCESSOR
21
SUBNET A
314b
SUBNET ID CODE REQUESTING UNIT
315b
SUBNET ID CODE REPORTING UNIT
316b
SUBNET ID CODE CONFIRMATION UNIT
317b
RECEIVED MESSAGE INTERPRETER
319b
INTRA-SUBNET COMMUNICATION PROCESSOR
22
SUBNET B

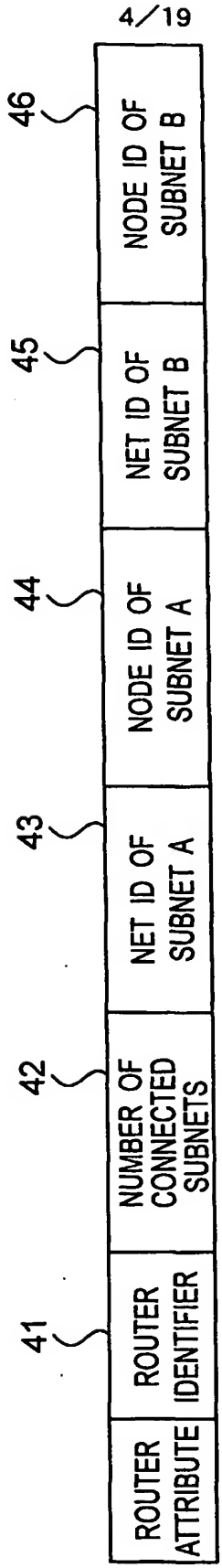
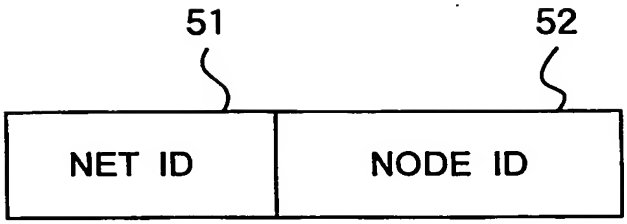

ROUTER ATTRIBUTE
ROUTER IDENTIFIER
NUMBER OF CONNECTED SUBNETS
NET ID OF SUBNET A
NODE ID OF SUBNET A
NET ID OF SUBNET B
NODE ID OF SUBNET B
41
42
43
44
45
46

Fig.4

Fig.5



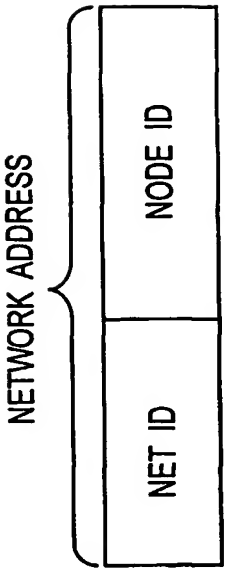

NETWORK ADDRESS
NET ID
NODE ID

Fig.6A

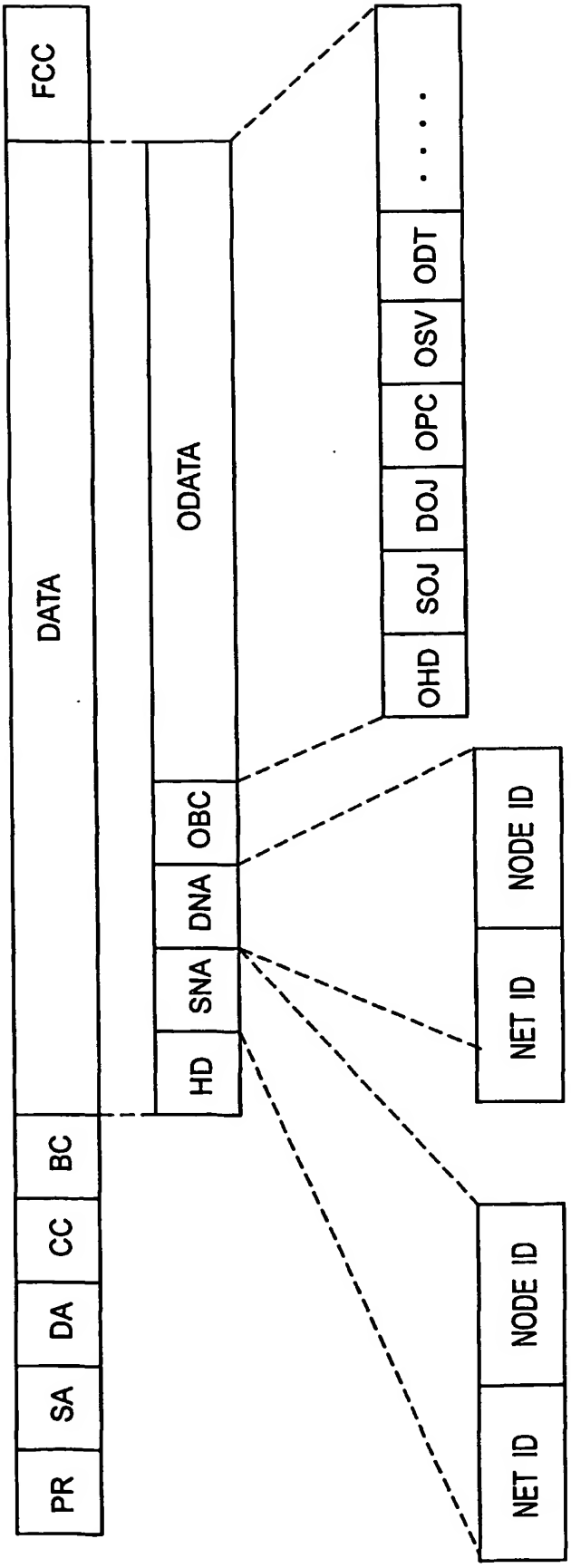

PR
SA
DA
CC
BC
DATA
HD
SNA
DNA
OBC
ODATA
OHD
SOJ
DOJ
OPC
OSV
ODT
. . . .
FCC
NET ID
NODE ID
NET ID
NODE ID
NET ID
NODE ID

Fig.6B

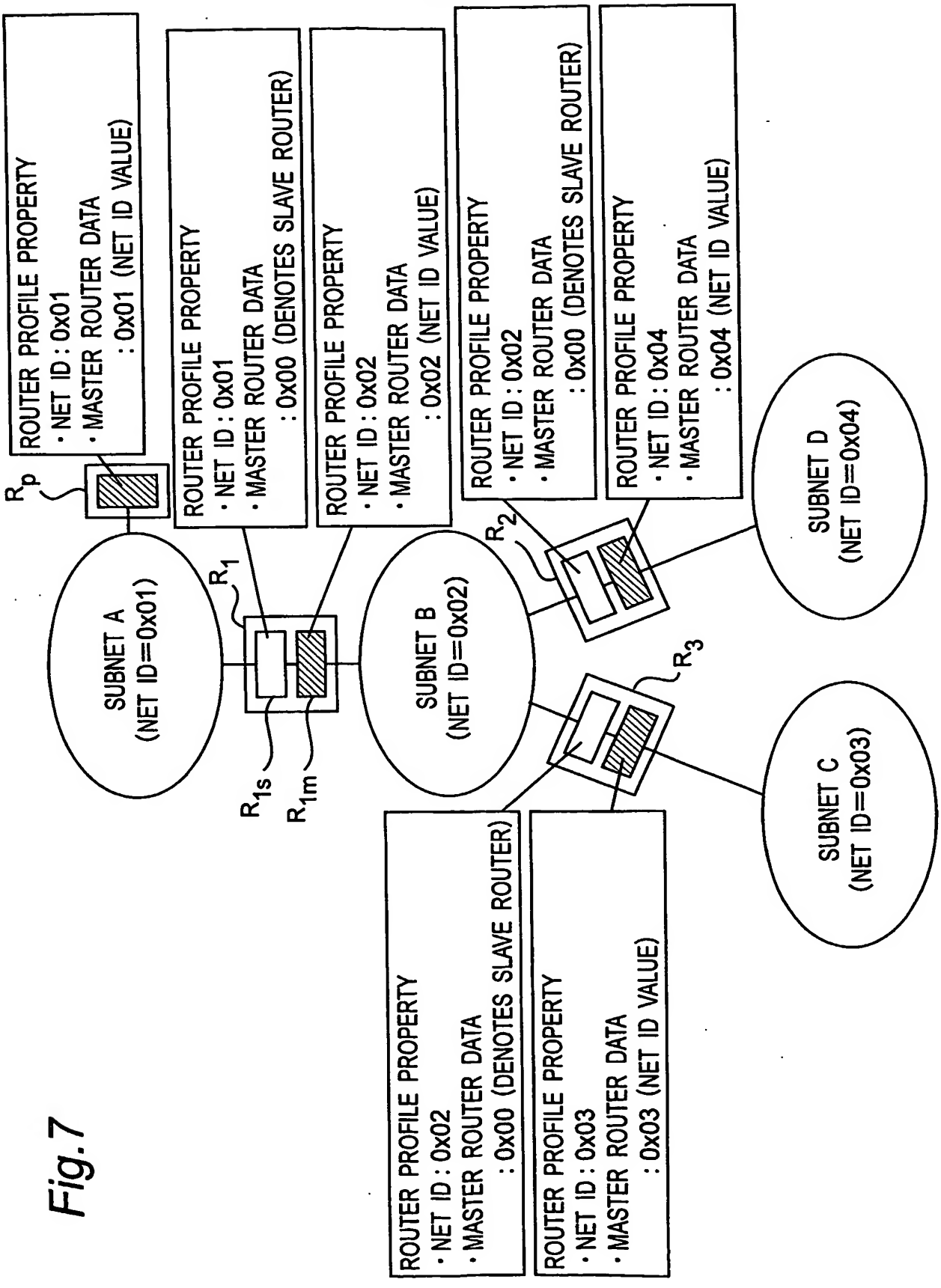

ROUTER PROFILE PROPERTY
・NET ID : 0x01
・MASTER ROUTER DATA
: 0x01 (NET ID VALUE)
R_p
SUBNET A
(NET ID=0x01)
R_1
R_{1s}
R_{1m}
ROUTER PROFILE PROPERTY
・NET ID : 0x01
・MASTER ROUTER DATA
: 0x00 (DENOTES SLAVE ROUTER)
ROUTER PROFILE PROPERTY
・NET ID : 0x02
・MASTER ROUTER DATA
: 0x02 (NET ID VALUE)
SUBNET B
(NET ID=0x02)
R_2
ROUTER PROFILE PROPERTY
・NET ID : 0x02
・MASTER ROUTER DATA
: 0x00 (DENOTES SLAVE ROUTER)
ROUTER PROFILE PROPERTY
・NET ID : 0x04
・MASTER ROUTER DATA
: 0x04 (NET ID VALUE)
SUBNET D
(NET ID=0x04)
R_3
SUBNET C
(NET ID=0x03)
ROUTER PROFILE PROPERTY
・NET ID : 0x02
・MASTER ROUTER DATA
: 0x00 (DENOTES SLAVE ROUTER)
ROUTER PROFILE PROPERTY
・NET ID : 0x03
・MASTER ROUTER DATA
: 0x03 (NET ID VALUE)

Fig.7

Fig.8

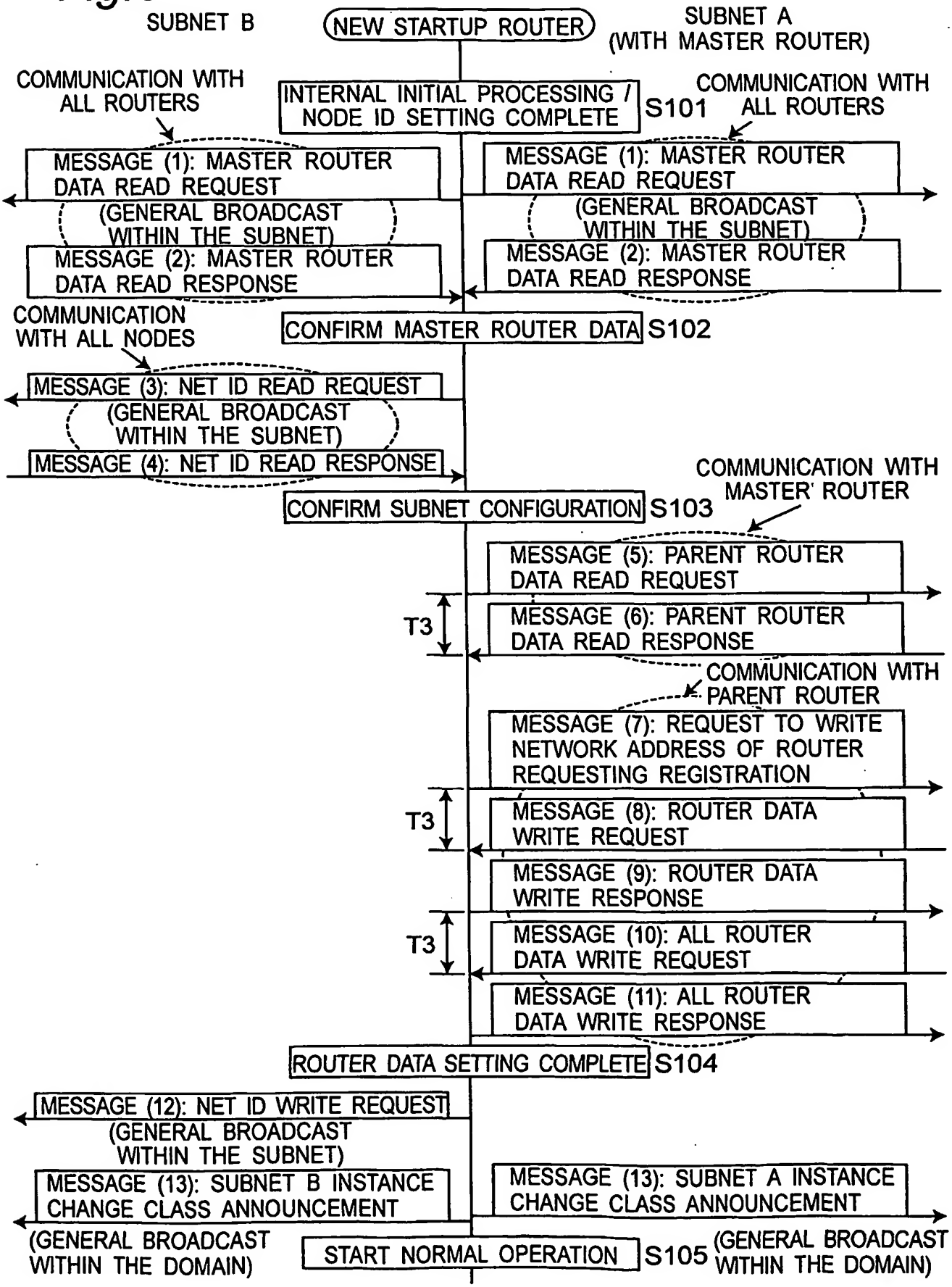

SUBNET B
NEW STARTUP ROUTER
SUBNET A (WITH MASTER ROUTER)
COMMUNICATION WITH ALL ROUTERS
INTERNAL INITIAL PROCESSING / NODE ID SETTING COMPLETE
S101
COMMUNICATION WITH ALL ROUTERS
MESSAGE (1): MASTER ROUTER DATA READ REQUEST
(GENERAL BROADCAST WITHIN THE SUBNET)
MESSAGE (2): MASTER ROUTER DATA READ RESPONSE
MESSAGE (1): MASTER ROUTER DATA READ REQUEST
(GENERAL BROADCAST WITHIN THE SUBNET)
MESSAGE (2): MASTER ROUTER DATA READ RESPONSE
COMMUNICATION WITH ALL NODES
CONFIRM MASTER ROUTER DATA
S102
MESSAGE (3): NET ID READ REQUEST
(GENERAL BROADCAST WITHIN THE SUBNET)
MESSAGE (4): NET ID READ RESPONSE
COMMUNICATION WITH MASTER ROUTER
CONFIRM SUBNET CONFIGURATION
S103
MESSAGE (5): PARENT ROUTER DATA READ REQUEST
T3
MESSAGE (6): PARENT ROUTER DATA READ RESPONSE
COMMUNICATION WITH PARENT ROUTER
MESSAGE (7): REQUEST TO WRITE NETWORK ADDRESS OF ROUTER REQUESTING REGISTRATION
T3
MESSAGE (8): ROUTER DATA WRITE REQUEST
MESSAGE (9): ROUTER DATA WRITE RESPONSE
T3
MESSAGE (10): ALL ROUTER DATA WRITE REQUEST
MESSAGE (11): ALL ROUTER DATA WRITE RESPONSE
ROUTER DATA SETTING COMPLETE
S104
MESSAGE (12): NET ID WRITE REQUEST
(GENERAL BROADCAST WITHIN THE SUBNET)
MESSAGE (13): SUBNET B INSTANCE CHANGE CLASS ANNOUNCEMENT
(GENERAL BROADCAST WITHIN THE DOMAIN)
MESSAGE (13): SUBNET A INSTANCE CHANGE CLASS ANNOUNCEMENT
(GENERAL BROADCAST WITHIN THE DOMAIN)
START NORMAL OPERATION
S105

Fig.9

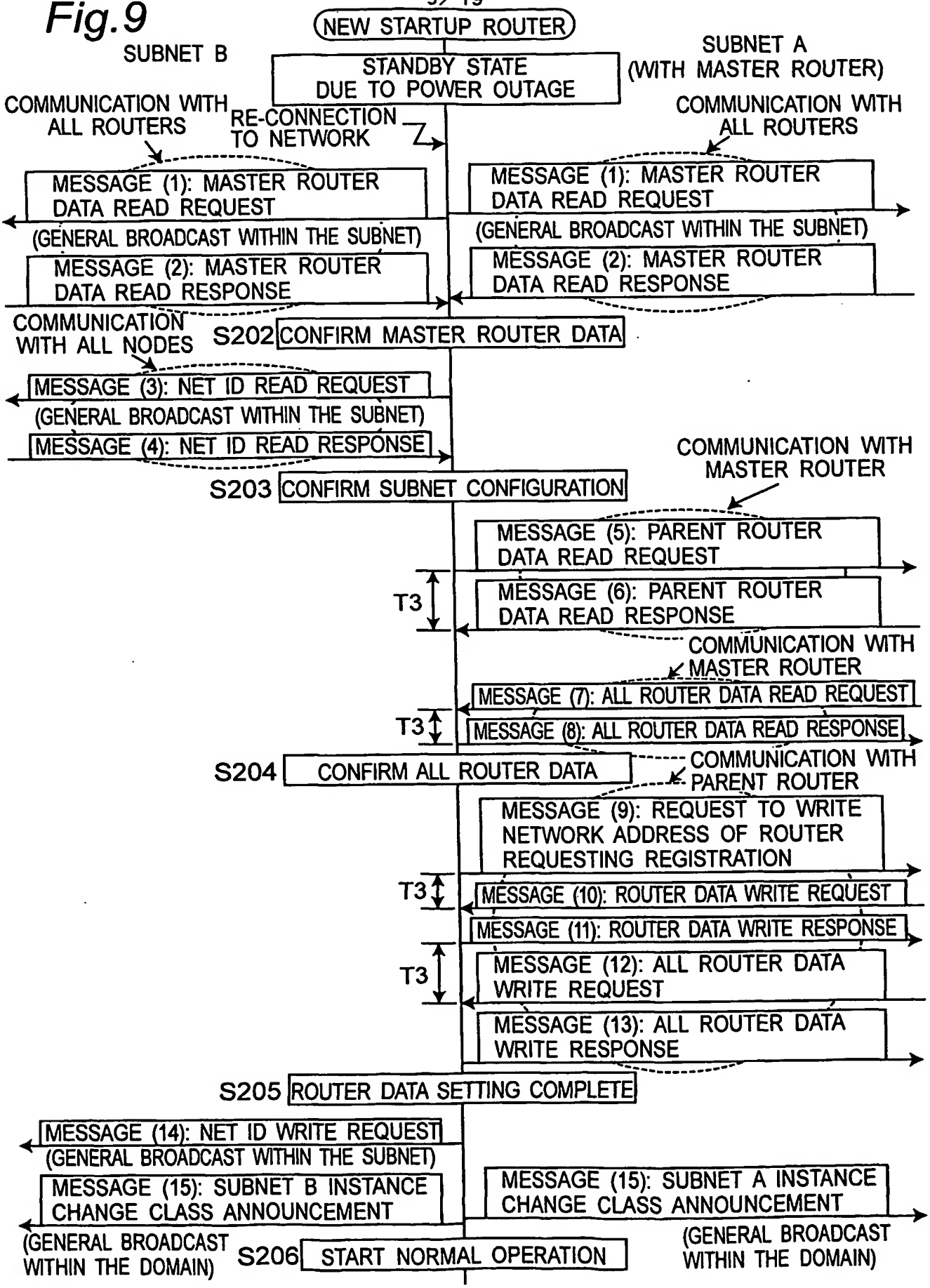

NEW STARTUP ROUTER
SUBNET B
STANDBY STATE DUE TO POWER OUTAGE
SUBNET A (WITH MASTER ROUTER)
COMMUNICATION WITH ALL ROUTERS
RE-CONNECTION TO NETWORK
COMMUNICATION WITH ALL ROUTERS
MESSAGE (1): MASTER ROUTER DATA READ REQUEST
MESSAGE (1): MASTER ROUTER DATA READ REQUEST
(GENERAL BROADCAST WITHIN THE SUBNET)
(GENERAL BROADCAST WITHIN THE SUBNET)
MESSAGE (2): MASTER ROUTER DATA READ RESPONSE
MESSAGE (2): MASTER ROUTER DATA READ RESPONSE
COMMUNICATION WITH ALL NODES
S202 CONFIRM MASTER ROUTER DATA
MESSAGE (3): NET ID READ REQUEST
(GENERAL BROADCAST WITHIN THE SUBNET)
MESSAGE (4): NET ID READ RESPONSE
COMMUNICATION WITH MASTER ROUTER
S203 CONFIRM SUBNET CONFIGURATION
MESSAGE (5): PARENT ROUTER DATA READ REQUEST
T3
MESSAGE (6): PARENT ROUTER DATA READ RESPONSE
COMMUNICATION WITH MASTER ROUTER
MESSAGE (7): ALL ROUTER DATA READ REQUEST
T3
MESSAGE (8): ALL ROUTER DATA READ RESPONSE
S204 CONFIRM ALL ROUTER DATA
COMMUNICATION WITH PARENT ROUTER
MESSAGE (9): REQUEST TO WRITE NETWORK ADDRESS OF ROUTER REQUESTING REGISTRATION
T3
MESSAGE (10): ROUTER DATA WRITE REQUEST
MESSAGE (11): ROUTER DATA WRITE RESPONSE
T3
MESSAGE (12): ALL ROUTER DATA WRITE REQUEST
MESSAGE (13): ALL ROUTER DATA WRITE RESPONSE
S205 ROUTER DATA SETTING COMPLETE
MESSAGE (14): NET ID WRITE REQUEST
(GENERAL BROADCAST WITHIN THE SUBNET)
MESSAGE (15): SUBNET B INSTANCE CHANGE CLASS ANNOUNCEMENT
MESSAGE (15): SUBNET A INSTANCE CHANGE CLASS ANNOUNCEMENT
(GENERAL BROADCAST WITHIN THE DOMAIN)
S206 START NORMAL OPERATION
(GENERAL BROADCAST WITHIN THE DOMAIN)

Fig.10

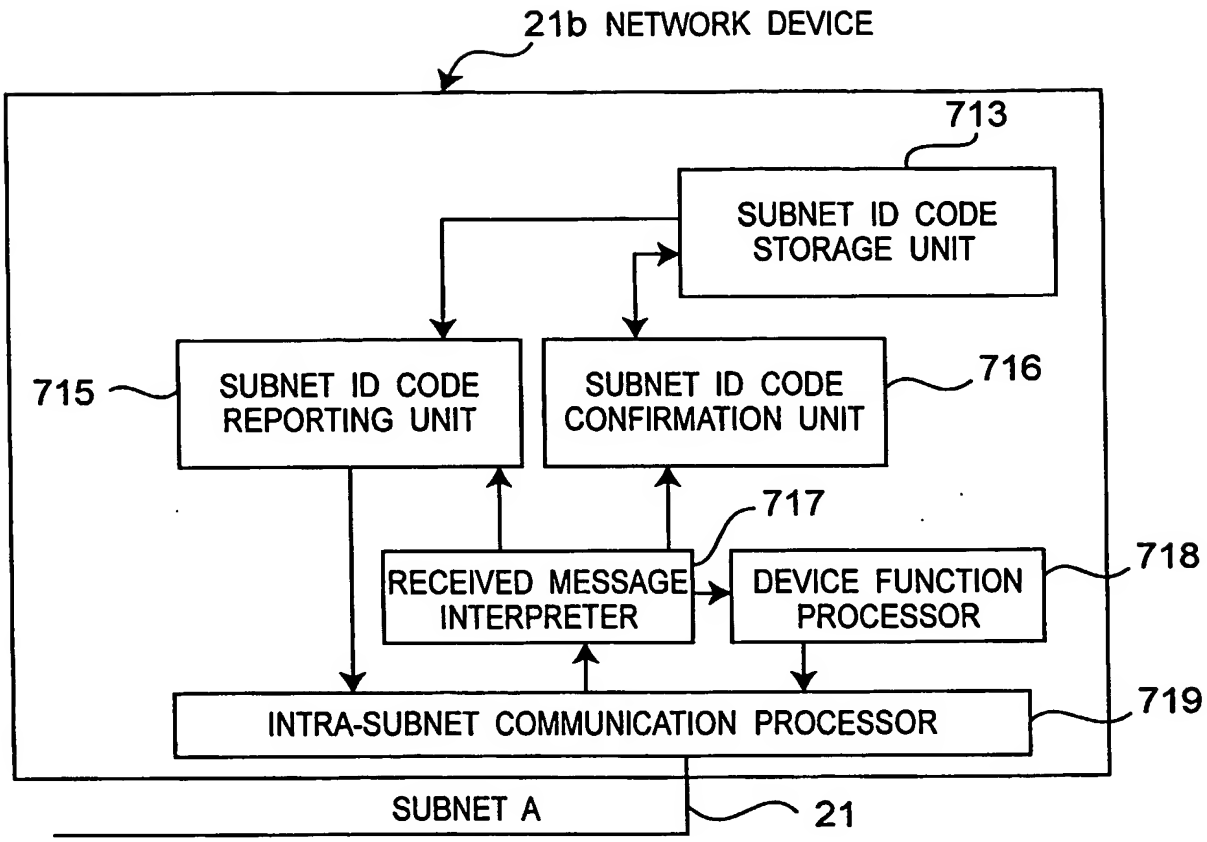

21b NETWORK DEVICE
713
SUBNET ID CODE STORAGE UNIT
715
SUBNET ID CODE REPORTING UNIT
SUBNET ID CODE CONFIRMATION UNIT
716
717
RECEIVED MESSAGE INTERPRETER
DEVICE FUNCTION PROCESSOR
718
INTRA-SUBNET COMMUNICATION PROCESSOR
719
SUBNET A
21

Fig.11A

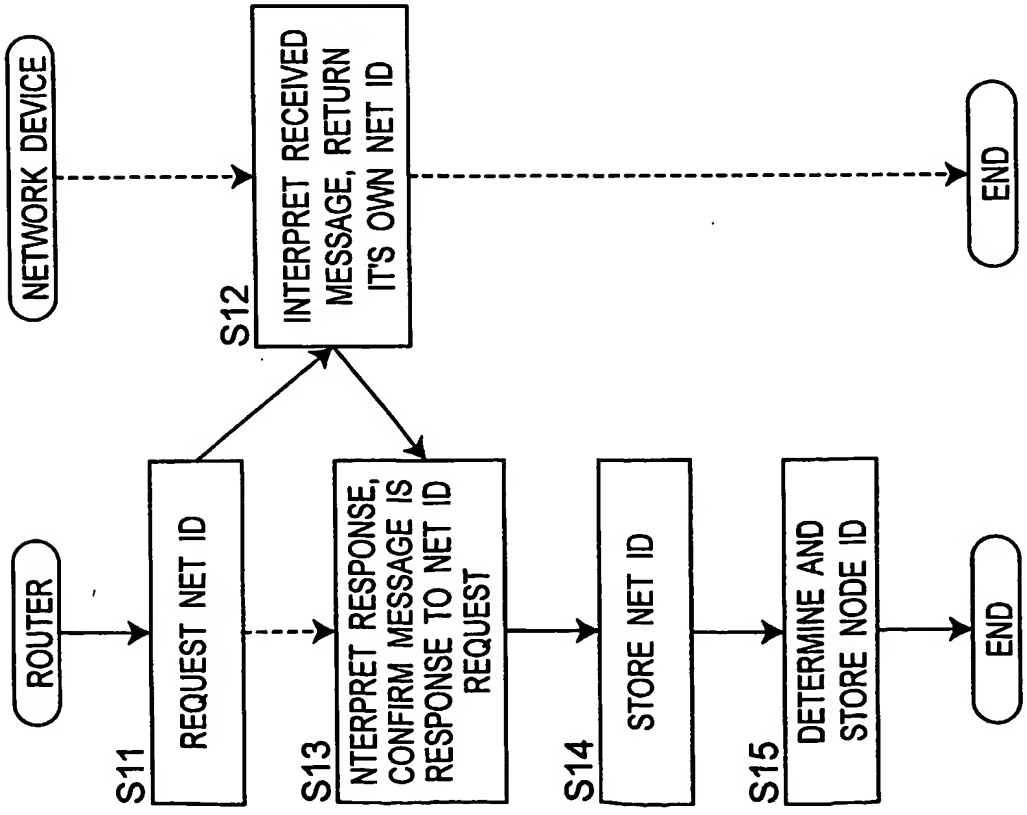


Fig.11B

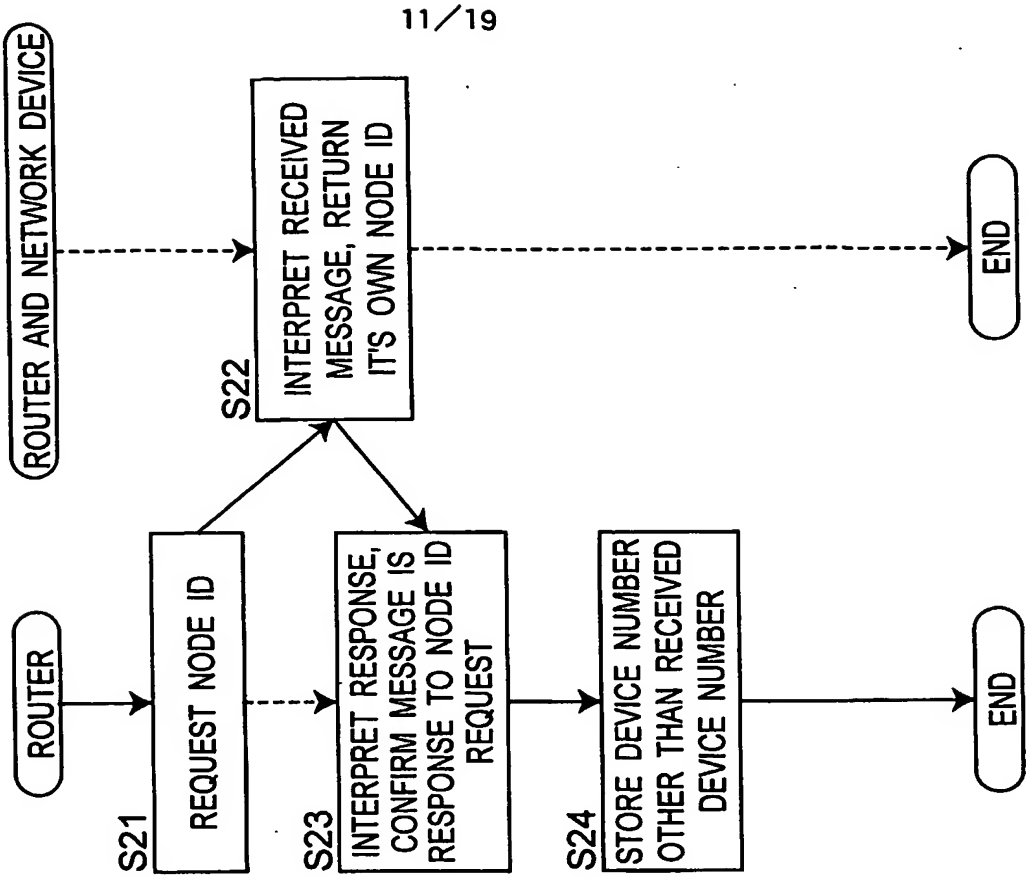
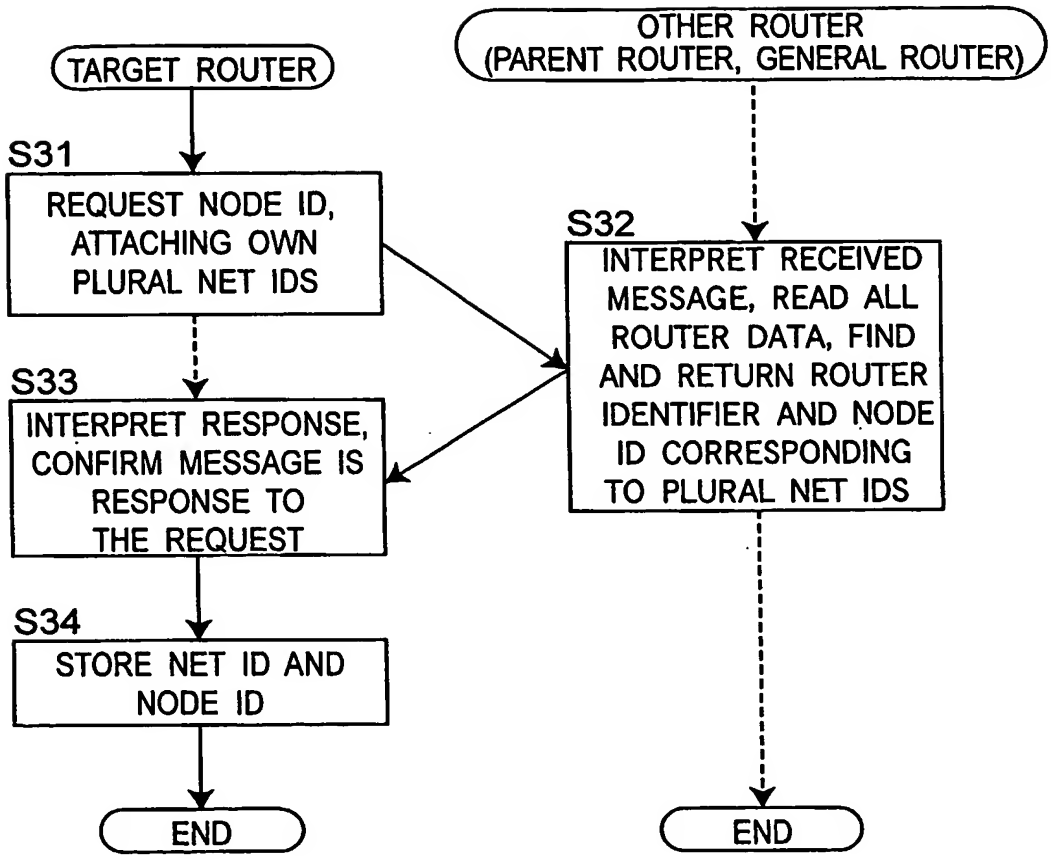


Fig.12


TARGET ROUTER
OTHER ROUTER
(PARENT ROUTER, GENERAL ROUTER)
S31
REQUEST NODE ID, ATTACHING OWN PLURAL NET IDS
S32
INTERPRET RECEIVED MESSAGE, READ ALL ROUTER DATA, FIND AND RETURN ROUTER IDENTIFIER AND NODE ID CORRESPONDING TO PLURAL NET IDS
S33
INTERPRET RESPONSE, CONFIRM MESSAGE IS RESPONSE TO THE REQUEST
S34
STORE NET ID AND NODE ID
END
END

ROUTER IDENTIFIER
NUMBER OF CONNECTED SUBNETS
NET ID OF SUBNET A
NODE ID OF SUBNET A
NET ID OF SUBNET B
NODE ID OF SUBNET B
MASTER ROUTER DATA FOR SUBNET A
MASTER ROUTER DATA FOR SUBNET B
41
42
43
44
45
46
47
48

Fig.13

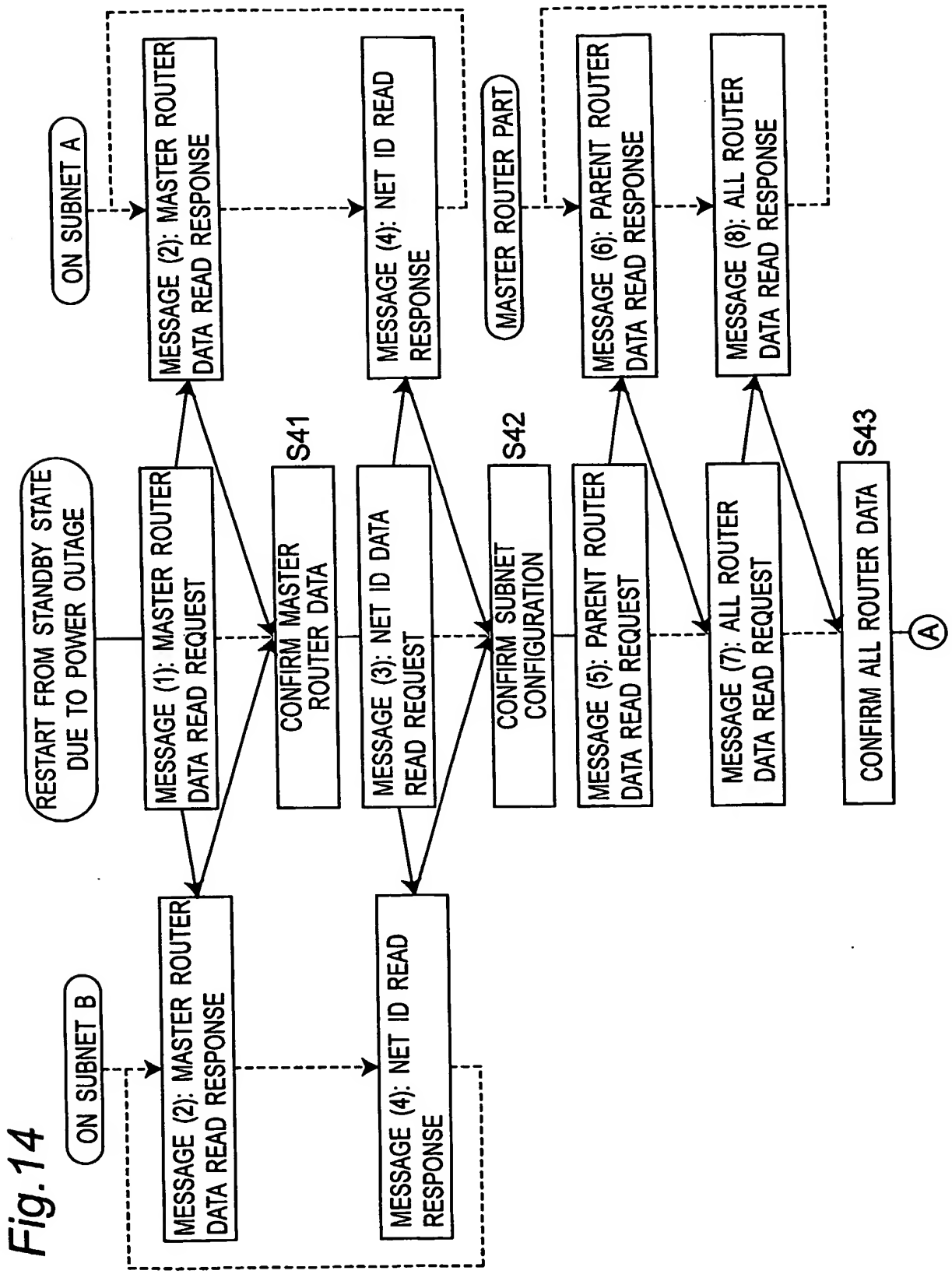

RESTART FROM STANDBY STATE DUE TO POWER OUTAGE
ON SUBNET A
ON SUBNET B
MESSAGE (1): MASTER ROUTER DATA READ REQUEST
MESSAGE (2): MASTER ROUTER DATA READ RESPONSE
MESSAGE (2): MASTER ROUTER DATA READ RESPONSE
S41
CONFIRM MASTER ROUTER DATA
MESSAGE (3): NET ID DATA READ REQUEST
MESSAGE (4): NET ID READ RESPONSE
MESSAGE (4): NET ID READ RESPONSE
MASTER ROUTER PART
S42
CONFIRM SUBNET CONFIGURATION
MESSAGE (5): PARENT ROUTER DATA READ REQUEST
MESSAGE (6): PARENT ROUTER DATA READ RESPONSE
MESSAGE (7): ALL ROUTER DATA READ REQUEST
MESSAGE (8): ALL ROUTER DATA READ RESPONSE
S43
CONFIRM ALL ROUTER DATA
A

Fig.14

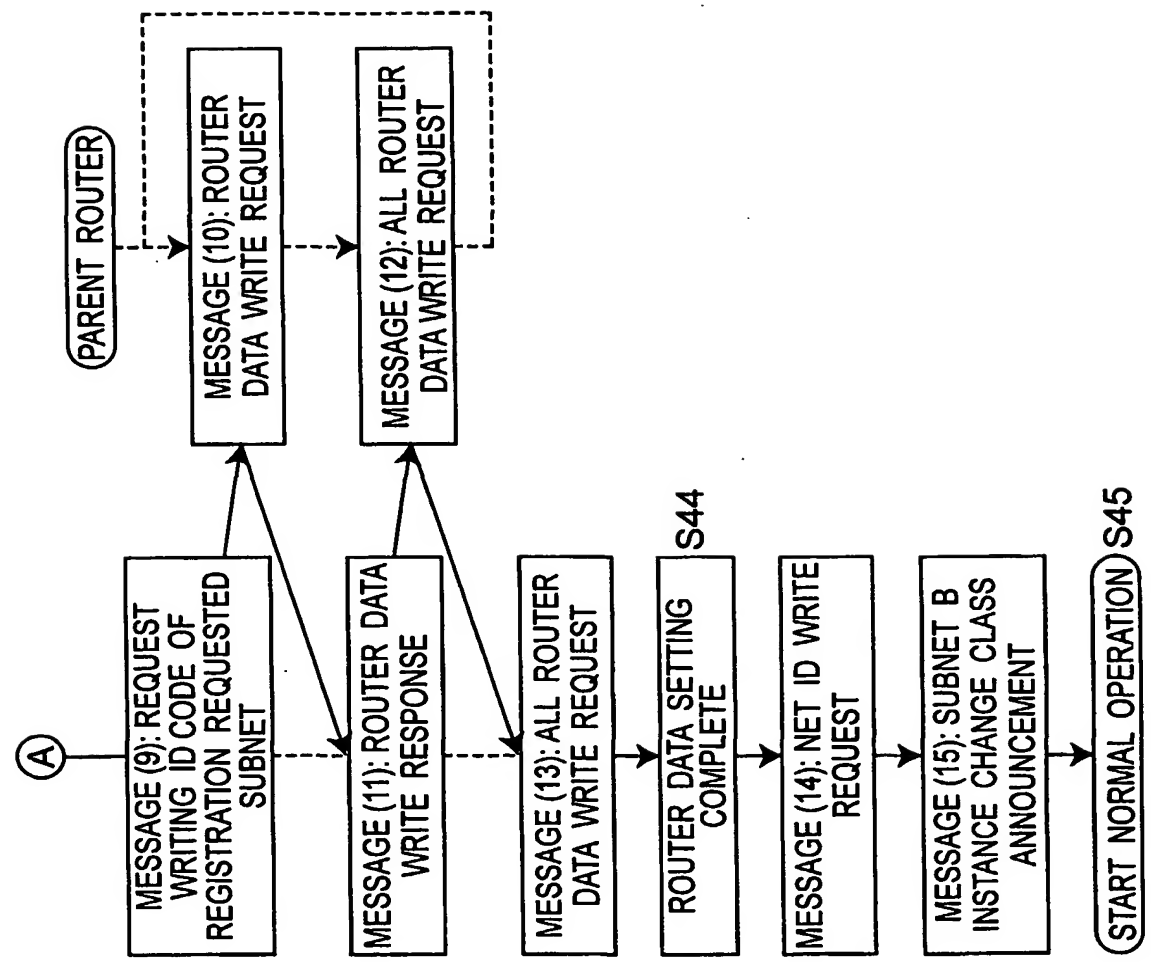

PARENT ROUTER
MESSAGE (10): ROUTER DATA WRITE REQUEST
MESSAGE (12): ALL ROUTER DATA WRITE REQUEST
A
MESSAGE (9): REQUEST WRITING ID CODE OF REGISTRATION REQUESTED SUBNET
MESSAGE (11): ROUTER DATA WRITE RESPONSE
MESSAGE (13): ALL ROUTER DATA WRITE REQUEST
S44
ROUTER DATA SETTING COMPLETE
MESSAGE (14): NET ID WRITE REQUEST
MESSAGE (15): SUBNET B INSTANCE CHANGE CLASS ANNOUNCEMENT
S45
START NORMAL OPERATION

Fig.15

Fig.16A

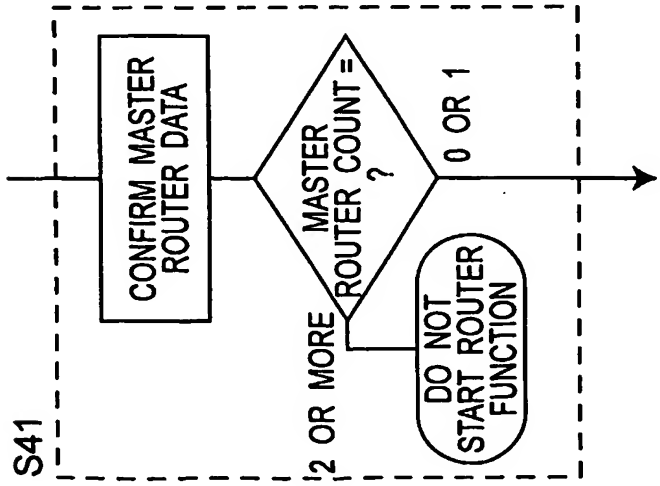


Fig.16B

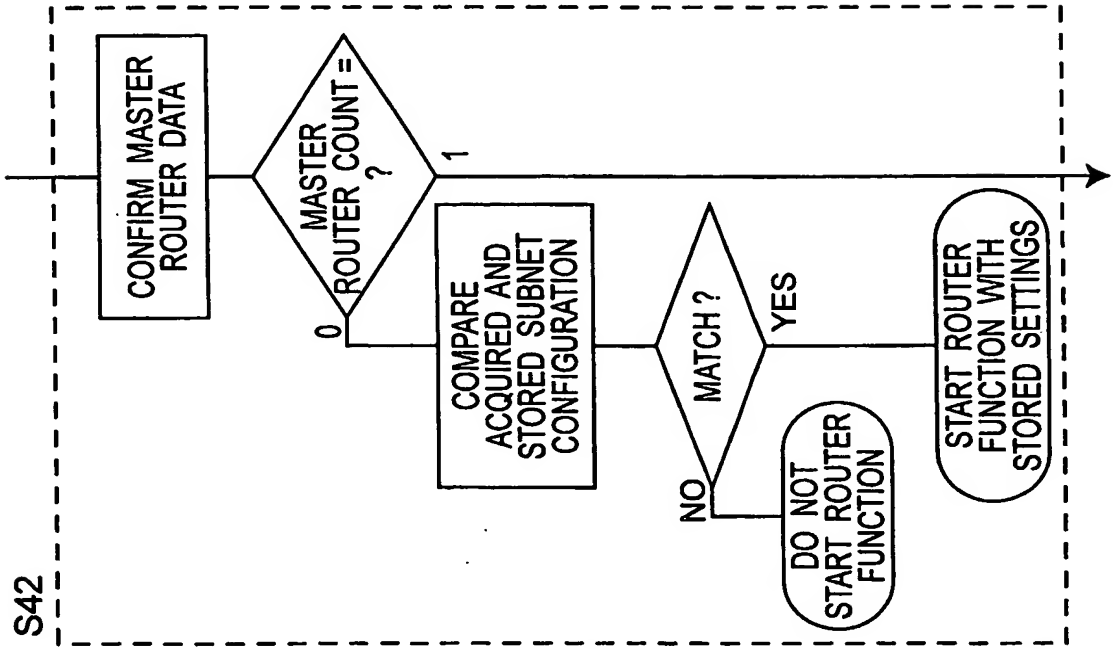


Fig.16C

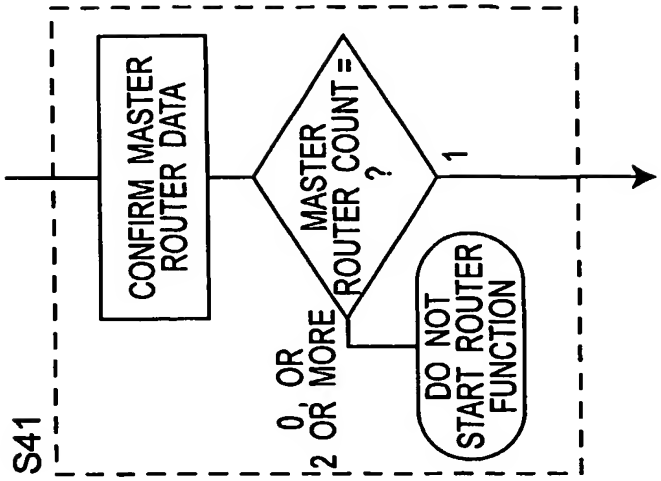


Fig.17

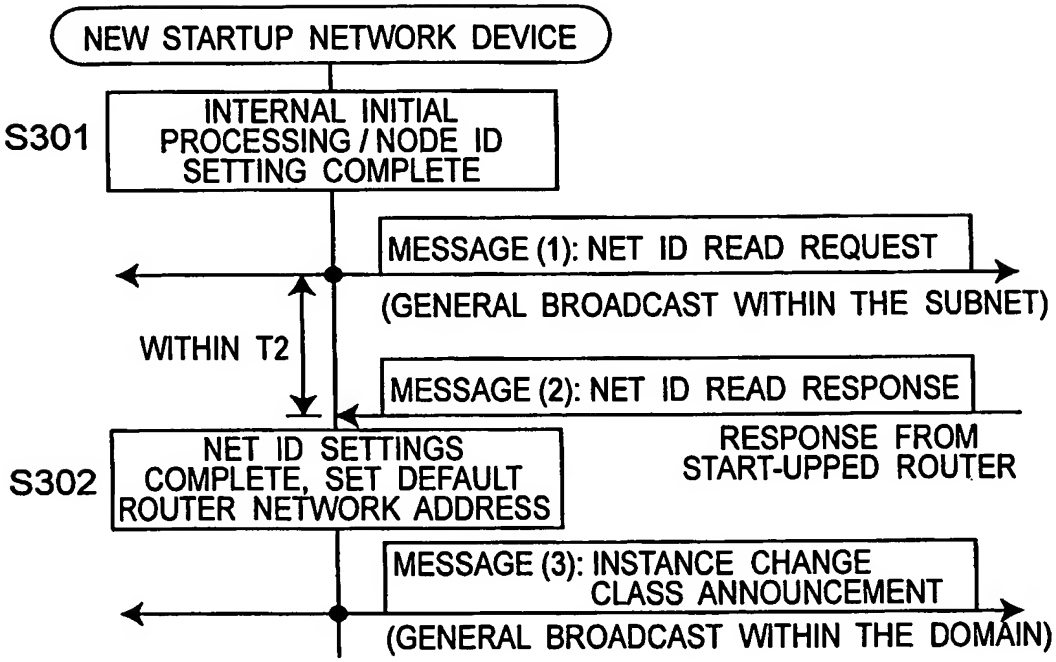

NEW STARTUP NETWORK DEVICE
S301
INTERNAL INITIAL PROCESSING / NODE ID SETTING COMPLETE
MESSAGE (1): NET ID READ REQUEST
(GENERAL BROADCAST WITHIN THE SUBNET)
WITHIN T2
MESSAGE (2): NET ID READ RESPONSE
RESPONSE FROM START-UPPED ROUTER
S302
NET ID SETTINGS COMPLETE, SET DEFAULT ROUTER NETWORK ADDRESS
MESSAGE (3): INSTANCE CHANGE CLASS ANNOUNCEMENT
(GENERAL BROADCAST WITHIN THE DOMAIN)

Fig.18

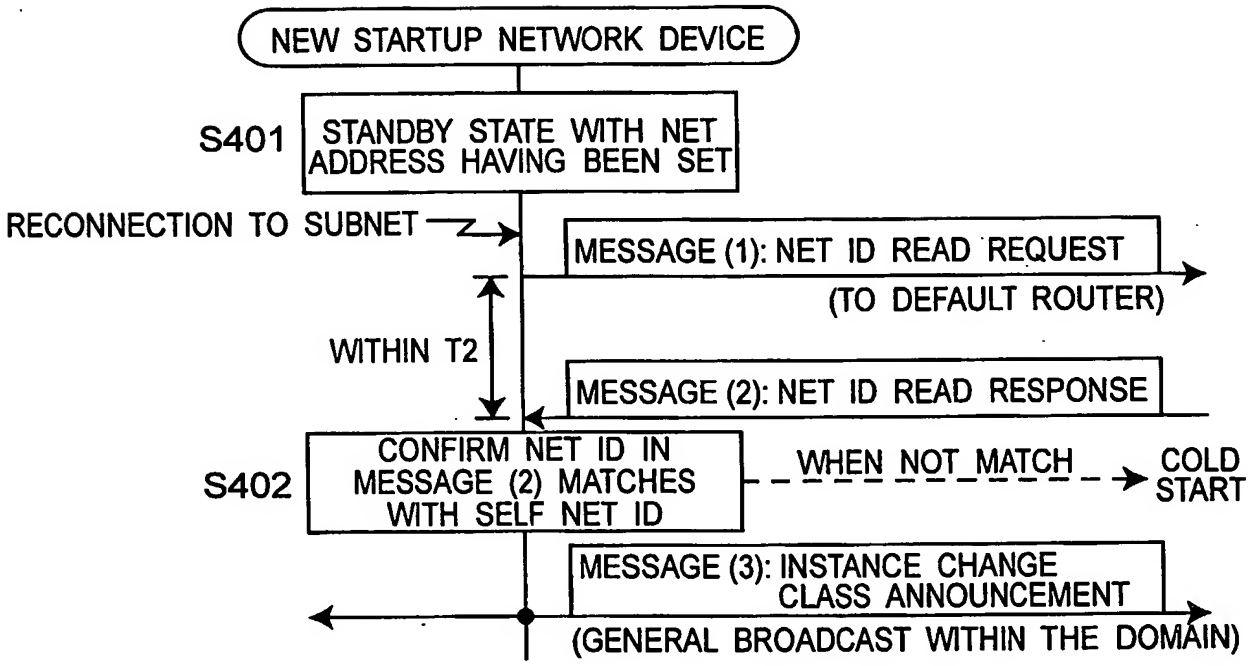
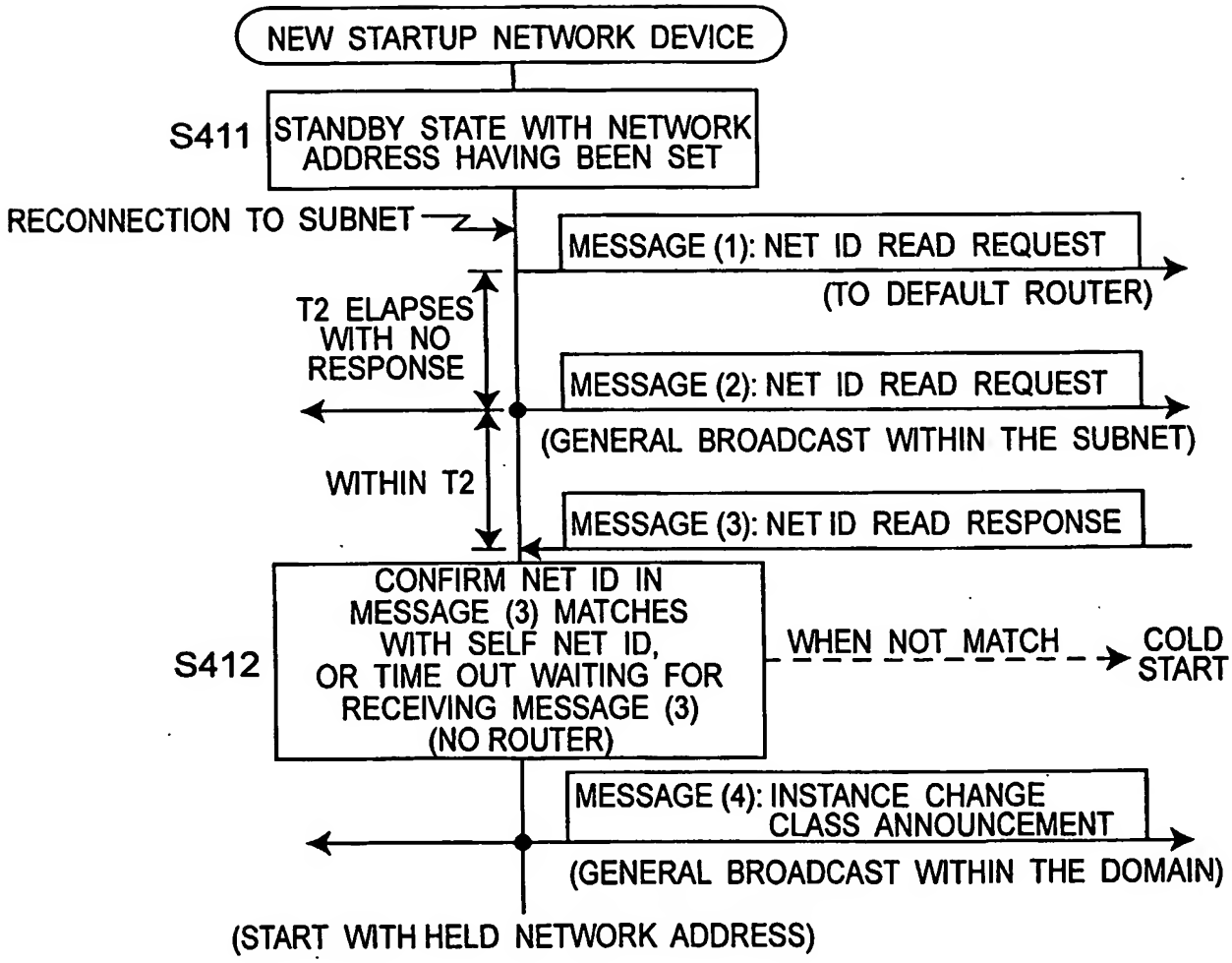

NEW STARTUP NETWORK DEVICE
S401
STANDBY STATE WITH NET ADDRESS HAVING BEEN SET
RECONNECTION TO SUBNET
MESSAGE (1): NET ID READ REQUEST
(TO DEFAULT ROUTER)
WITHIN T2
MESSAGE (2): NET ID READ RESPONSE
S402
CONFIRM NET ID IN MESSAGE (2) MATCHES WITH SELF NET ID
WHEN NOT MATCH
COLD START
MESSAGE (3): INSTANCE CHANGE CLASS ANNOUNCEMENT
(GENERAL BROADCAST WITHIN THE DOMAIN)

Fig.19


NEW STARTUP NETWORK DEVICE
S411
STANDBY STATE WITH NETWORK ADDRESS HAVING BEEN SET
RECONNECTION TO SUBNET
MESSAGE (1): NET ID READ REQUEST
(TO DEFAULT ROUTER)
T2 ELAPSES WITH NO RESPONSE
MESSAGE (2): NET ID READ REQUEST
(GENERAL BROADCAST WITHIN THE SUBNET)
WITHIN T2
MESSAGE (3): NET ID READ RESPONSE
S412
CONFIRM NET ID IN MESSAGE (3) MATCHES WITH SELF NET ID, OR TIME OUT WAITING FOR RECEIVING MESSAGE (3) (NO ROUTER)
WHEN NOT MATCH
COLD START
MESSAGE (4): INSTANCE CHANGE CLASS ANNOUNCEMENT
(GENERAL BROADCAST WITHIN THE DOMAIN)
(START WITH HELD NETWORK ADDRESS)